REMARKS

The Office Action dated December 26, 2006 has been reviewed carefully and the application has been amended in a sincere effort to place it in condition for allowance. All objections and rejections are respectfully traversed.

Claims 2-10, 12-16 and 18 were pending in the application. New claims 23 through 26 have been added for consideration by the Examiner. New Claim 23 is supported by the Specification at Page 8, line 6 through Page 10, line 4. New claim 24 is supported by the Specification at Page 10, lines 21-25. New claim 25 is supported by the Specification at Page 11, lines 4-7. New claim 26 is supported by the Specification at Page 10, lines 12-14.

Claim Objections

Claim 18 was objected to as being of improper dependent form. The claim has amended to properly depend upon independent claim 10.

Claim Rejections – 35 U.S.C.§101

Claims 2-10, 12-16 and 18 were rejected under 35 U.S.C.§101 for failure to produce a useful, tangible and concrete result. Applicant's claimed invention provides a software program for automatically calibrating a water distribution model. The set of results generated by the program for calibrating the water distribution model are referred to as calibration solutions.

Independent claim 2 has been amended herein to indicate that the steps are performed ***until a user selected desired goodness-of-fit value is obtained resulting in a corresponding calibration solution for calibrating a water distribution model.*** Claim 10 has been similarly amended. These methods and software processes provide the useful, tangible and concrete result of automatically calibrating a water distribution model.

Claim Rejections – 35 U.S.C. §112

Claims 2-10, 12-16 and 18 were rejected under 35 U.S.C. §112.

As per claim 3, the Specification clearly states that "the user may deliberately weight the observed data for focusing the calibration on critical data points. In order to do so, the user selects one of four weighting functions which can include …linear, square, square root and logarithm to conduct the calibration on the weighted, observed hydraulic grade line (HGL) and/or pipe flows…." (Specification, Page 9, lines 1 – 5). Claim 3 has been amended to clarify that the weighting function is applied to the field observed data. Those skilled in the art would thus be enabled to understand the concept of applying the well known weighting functions of linear, square, square root and logarithm to weight critical data points prior to the calculations of the difference between the actual observed data as weighted and the computer generated data.

As per claims 2, 10 and 12, the Applicant has amended the claims to refer to "calibration solutions" and the goal is to find the calibration solution that meets the user defined criteria, being the user selected goodness-of-fit value. Those skilled in the art will understand that Applicant's claimed invention seeks to find a calibration solution that satisfies the user's criteria. The Specification states that "Multiple *near* optimal solutions can be made available at the end of the genetic algorithm run." (Specification, Page 5, line 28-29). Notably, this is consistent with Applicant's WaterCAD for Windows Version 5 User's Guide quoted by the Examiner.

Accordingly, those skilled in the art will be enabled to make and/or use the invention as claimed in the amended claims.

Claim Rejections – 35 U.S.C.§102(b)

Claims 2-5, 7-10 and 12-16 and 18 were rejected under 35 U.S.C. 102(b) as being anticipated by the printed publication, Walters, "Calibration of Water Distribution Network Models Using Genetic Algorithms." ("Walters").

Applicant's invention as claimed in amended independent claim 2 comprises in part:

> A method of automatically calibrating a water distribution model of a water distribution network, comprising the steps of:
> (A) ***selecting calibration parameters including link status and one or more of pipe roughness and junction demand***;
> (B) obtaining field observed data including a pipe flow measurement and a junction pressure measurement for at least one point in the water distribution network, and including corresponding loading conditions and boundary conditions that existed in the network when said field observed data was collected and passing such data to a genetic algorithm module;
> ***(C) generating at said genetic algorithm module, a population of calibration solutions that comprise a set of calibration results, using a genetic algorithm;***
> ***(D) running multiple hydraulic simulations of each solution to obtain a set of predictions of pipe flows and junction pressures at selected points in the network, corresponding to said loading conditions and boundary conditions;***
> ***(E) performing a calibration evaluation including computing a goodness-of-fit value for each calibration solution based upon differences between field observed values and said predictions; and***
> ***(F) repeating steps (C) through (E) until a user selected desired goodness-of-fit value is obtained resulting in a corresponding calibration solution for calibrating a water distribution model.***

In Walters, there is a suggestion that artificial throttle valves may have remained in the model by original model builders due to an attempt to manually calibrate the system. This does not anticipate Applicant's additional calibration parameters of link status and junction demand. Thus, Walters cannot have anticipated Applicant's claimed invention due to the absence from Walters of the feature of: ***selecting calibration parameters including link status and one or more of pipe roughness and junction demand.***

Furthermore, the parameter discussed in Walters is pipe roughness coefficient (Walters Page 34, Part 3), and Walters appears to discuss this with reference to refining

the GA (genetic algorithm) before the algorithm is performed. It is unclear that Walters is even suggesting that the pipe roughness is used as a calibration solution in a hydraulic simulation of the model and later to be evaluated as a calibration parameter for the model. Absent such a teaching, Walters does not anticipate Applicant's claimed features of: ***(C) generating at said genetic algorithm module, a population of calibration solutions that comprise a set of calibration results, using a genetic algorithm;***

(D) running multiple hydraulic simulations of each solution to obtain a set of predictions of pipe flows and junction pressures at selected points in the network, corresponding to said loading conditions and boundary conditions;

(E) performing a calibration evaluation including computing a goodness-of-fit value for each calibration solution based upon differences between field observed values and said predictions; and

(F) repeating steps (C) through (E) until a user selected desired goodness-of-fit value is obtained resulting in a corresponding calibration solution for calibrating a water distribution model.

With respect to claim 10, in addition to the points already mentioned with respect to claim 2, which also apply to claim 10, Walters fails to disclose junction demand information, roughness groups and link status as calibration parameters to be generated by the software program. Walters suggests only a genetic algorithm that involves calculating pipe roughness coefficient values, and does not explain how these are used. Furthermore, Walters does not suggest applying a roughness figure to one group of pipes and a

different roughness value for a different pipe roughness group. Moreover, the feature in Applicant's claimed invention of including demand loadings (for given times of day) is also absent from Walters. Walters mentions demand but not as a calibration parameter to be determined as in Applicant's claimed invention. It is not clear that Walters suggests use of boundary conditions. In view of the numerous features of Applicant's claimed invention that are absent from Walters, then Walters cannot have anticipated Applicant's invention. In order to enhance the claims and clarify these distinctions over Walters, all of the independent claims have been amended herein.

It is believed that the dependent claims depend from allowable independent claims, and thus it is respectfully submitted that the dependent claims are also in condition for allowance.

New claim 23 is a claim for a computer implemented method, and it contains limitations that are not taught by Walters, such as link status and demand as calibration parameters to be determined. The sensitivity analysis, historical data and pipe roughness group features of claims 24, 25 and 26, respectively, are also not taught by Walters.

SUMMARY

All of the claims have been amended herein either directly or through dependency. It is believed that the application is now in condition for allowance.

Please do not hesitate to contact the undersigned in order to advance the prosecution of this application in any respect.

Please charge any additional fee occasioned by this paper to our Deposit Account No. 03-1237.

Respectfully submitted,

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